

In the Claims:

1. A nuclear fuel assembly comprising:

5 A parallel array of elongated nuclear fuel elements supported between a lower nozzle and an upper nozzle and having an axial length along the elongated dimension of the nuclear fuel elements with a mid third region along the axial length;

10 A plurality of substantially evenly spaced main support grids arranged in tandem along the axial length of the fuel elements, between the upper nozzle and the lower nozzles, at least partially enclosing an axial portion of the circumference of each fuel rod within a support cell of the main grids to maintain a lateral  
15 spacing between fuel elements; and

At least one auxiliary grid positioned around the fuel elements in tandem with the main support grids at an elevation in the mid third region, the auxiliary grid comprising a plurality of support cells with at least one  
20 support cell for each fuel element.

2. The fuel assembly of Claim 1 wherein the auxiliary grid is supported substantially midway between two main support grids.

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3. The fuel assembly of Claim 1 including a plurality of auxiliary grids positioned between some, but not all of the main support grids.

30 4. The fuel assembly of Claim 3 wherein adjacent ones of the plurality of auxiliary grids share one main support grid between them.

5. The fuel assembly of Claim 3 wherein the auxiliary grids are positioned along a mid span of the fuel elements within the mid third region.

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6. The fuel assembly of Claim 1 wherein the main support grids and the auxiliary grid are of a different design.

10 7. The fuel assembly of Claim 6 wherein the auxiliary grid support cells have walls that respectively at least partially enclose a portion of the circumference of the fuel rods along a portion of their axial lengths, wherein the axial length of the walls of the auxiliary grid  
15 support cells is shorter than the corresponding walls of the main support grid cells.

8. The fuel assembly of Claim 6 wherein the auxiliary grid support cells have walls that respectively at least  
20 partially enclose a portion of the circumference of the fuel rods along a portion of their axial lengths and the walls of the auxiliary grid support cells have dimples and or springs that contact and support the fuel elements wherein the dimples and/or springs on the auxiliary  
25 support cells have a larger contact area with the fuel elements than corresponding dimples and/or springs on the walls of the main support grid cells.

9. The fuel assembly of Claim 8 wherein the dimples  
30 and/or springs on the walls of the respective auxiliary grid support cells are coplanar.

10. The fuel assembly of Claim 6 wherein at least some of the main support grids have mixing vanes and at least some of the auxiliary grids do not have mixing vanes.

5 11. The fuel assembly of Claim 10 wherein at least some of the main support grids have mixing vanes and the auxiliary grids do not have mixing vanes.

12. The fuel assembly of Claim 10 wherein the main  
10 support grids have mixing vanes and the auxiliary grids do not have mixing vanes.

13. The fuel assembly of Claim 1 wherein respective ones of the auxiliary grid support cells at least partially  
15 enclose guide thimbles for control rods and the auxiliary grids are maintained in their axial position by being mechanically or metallurgically affixed to at least some of the guide thimbles.

20 14. The fuel assembly of Claim 1 wherein the auxiliary grid has an outer strap that extends around its circumference and includes upwardly extending guide tabs that are inwardly directed at an angle of less than 90 degrees with the strap in the direction of the adjacent  
25 fuel element, to prevent hang-up with adjacent fuel assemblies during removal or insertion into a reactor core.